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In the Drawings:

The attached sheets of drawings include changes to Figs. 2 and 2A. The replacement sheets, which include Figs. 2 and 2A, replace the original sheets including Figs. 2 and 2A.

Attachment: Replacement Sheets
Annotated Sheets Showing Changes

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REMARKS

By way of this amendment, the specification and drawings have been amended. Claims 1-21 remain present and are rejected in this application. Applicants respectfully request reconsideration and allowance of the present application.

In the present non-final Office Action, the Examiner objected to the drawings under 37 C.F.R. § 1.83(a). Applicants have provided corrected drawing sheets clearly showing the PCB including a plurality of conductive layers, each separated by a non-conducting layer, at least one conductive trace of the PCB "plated through [sic] holes," and an automotive assembly. Because these elements were already disclosed in the claims and specification, the changes made to the drawings do not introduce new matter. Applicants respectfully submit that, with these changes, the drawing objection is now moot and the drawings are in condition for acceptance. Therefore, Applicants respectfully request that the objection to the drawings be withdrawn.

Next, the Examiner objected to claim 1 based on a lack of a proper antecedent basis. Applicants respectfully submit that the Examiner's citation and interpretation of claim 1, lines 9-10, is erroneous. The Examiner asserts that claim 1, lines 9-10, states "the PCB plated through holes." However, the cited section of claim 1 actually reads "the PCB through plated holes." Applicants respectfully submit that the Examiner's inversion of the words "plated" and "through" has led to an improper interpretation of the meaning of claim 1, and therefore an improper objection based on lack of proper antecedent basis. Applicants respectfully submit that claim 1, as worded, does have proper antecedent basis and respectfully request that the objection to claim 1 be withdrawn.

The Examiner also rejected claims 16-21 under 35 U.S.C. § 112, first paragraph, as failing to comply with the written description requirement. Applicants have amended the specification to recite the language in the claims with respect to an automotive assembly, engine control module, transmission control module, and sensor and power module. This is in addition to the discussion of these elements already present in paragraph [0022] of the specification. Because these elements were previously disclosed in the claims and the specification, these changes to the specification do not introduce new matter.

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Applicants respectfully submit that the elements noted by the Examiner as being insufficiently described are elements that would be known to one of ordinary skill in the art. The Examiner states that “[t]he specification is silent to describe a structure of ‘an automotive assembly, and the assembly is one of an engine control module, a transmission module, and a sensor and power module.’” Applicants respectfully submit that automotive assemblies that are any of an engine control module, transmission module, or a sensor and power module are well known to those of ordinary skill in the art in the automotive industry. More specifically, one of ordinary skill in the art would readily understand that the structure of an automotive assembly that is one of an engine control module, a transmission module, and a sensor and power module would contain electronic circuitry and could employ printed circuit boards (PCBs) for the mounting of electronic circuitry.

The Examiner also stated that “the drawings do not support for the claimed invention.” As noted above, Applicants have corrected the drawings to satisfy the Examiner by showing an automotive assembly. Based on the foregoing discussion, Applicants respectfully submit that the rejection of claims 16-21 under 35 U.S.C. § 112, first paragraph, should be withdrawn for at least these reasons.

The Examiner also rejected claims 1, 5-6, 8-9, and 15 under 35 U.S.C. § 102(b) as being anticipated by U.S. Patent No. 5,434,750 (hereinafter “Rostoker”). Before discussing the claim rejections and the applied references, it is important to appreciate Applicants’ claimed invention and the advantages realized therefrom. The invention provides for a printed circuit board (PCB) assembly that includes a PCB and a first integrated conductive bus structure extending from a first edge of the PCB. The PCB connects a plurality of electronic components and includes a plurality of conductive layers, each separated by a non-conductive layer. The first integrated conductive bus structure includes a first portion that extends from the first edge of the PCB and which forms a plurality of electrically separate contacts of a connector. A second portion of the bus structure is integrated within the PCB and couples each of the contacts to at least one conductive trace of the PCB through plated holes. Among other advantages, the invention provides for a PCB assembly that can be connected to an external bus, with a reduced amount of PCB area required for the connection.

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With regard to the rejection of claims 1, 5-6, 8-9, and 15 under 35 U.S.C. § 102(b) as being anticipated by Rostoker, Applicants respectfully submit that in order for a reference to anticipate a claim, the reference must teach each and every claim limitation. At the outset, Applicants note that Rostoker is primarily directed to a dambar-less leadframe sandwiched between two printed circuit boards (PCBs). The PCBs form a major portion of the packaging body and isolate the leadframe leads from plastic molding compound. Rostoker does not appear to teach "a first integrated conductive bus structure extending from a first edge of the PCB, wherein a first portion of the bus structure that extends from the edge of the PCB forms a plurality of electrically separate contacts of a connector and a second portion of the bus structure that is integrated within the PCB couples each of the contacts to at least one conductive trace of the PCB through plated holes."

The Examiner first states that "[a]s to claims 1, 5-6, 8-9, 15, Hernandez et al. [sic] discloses a printed circuit board (PCB) assembly (100) as shown in figures 1-11." The rejection is based on Rostoker, but the Examiner's remarks instead refer to Hernandez. Assuming that the Examiner's citation to Hernandez is intended to be a citation to Rostoker, Applicants first note that Figure 11 of Rostoker does not specifically disclose a printed circuit board (PCB) assembly. Rather, Rostoker discloses "a ceramic semiconductor package." (Column 16, line 34). The Examiner next states that "Hernandez et al. [sic] discloses...a printed circuit board (PCB-1118, see figure 11)." However, Rostoker does not disclose item 1118 of Figure 11 as being a PCB. Rather, Rostoker discloses 1118 as being "an interleaved ceramic layer 1118." (Column 16, lines 43-44). The Examiner further states that "Hernandez et al. [sic] discloses...the PCB including a plurality of conductive layers (1106-figure 11) each separated by a non-conductive layer (1116)." As noted above, the interleaved ceramic layer 1118 disclosed in Rostoker is not referred to as a PCB. However, assuming, for the sake of argument only, that interleaved ceramic layer 1118 is somehow a PCB, it is clear from Figure 11 that interleaved ceramic layer 1118 does not include a plurality of conductive layers 1106. According to Rostoker, conductive leads 1106 are "separated by an interleaved ceramic layer 1118." Therefore, Rostoker discloses layer 1118 separating leads 1106, not including leads 1106. Finally, assuming again, for the sake

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of argument only, that layer 1118 is somehow a PCB, Rostoker does not disclose layer 1118 including non-conductive layers 1116 separating conductive layers 1106. As is shown in Figure 11, layer 1118 is separate from and does not include non-conductive layers 1116.

The Examiner further states that Rostoker discloses "a first integrated conductive bus structure (102) extending from a first edge of the PCB (104, 106, figure 1), wherein a first portion (108-figure 2) of the bus structure that extends from the edge of the PCB forms a plurality of electrically separate contacts of a connector and a second portion (108b) of the bus structure that is integrated within the PCB couples each of the contacts to at least one conductive trace of the PCB through plated holes." It is first important to note how Rostoker describes Figure 1. Rostoker states in column 9, lines 16-21 "[w]ith particular reference to FIG. 1, the completed package 100 is essentially a sandwiched construction, wherein a leadframe 102 (shown in FIG. 2) is disposed between two printed circuit boards (PCBs)—an upper PCB (or substrate) 104 and a lower PCB (or substrate) 106." In other words, Rostoker discloses upper PCB 104 and lower PCB 106 as being separate PCBs with a leadframe 102 sandwiched between them. Figure 2 provides additional detail for leadframe 102. More specifically, Figure 2 shows the location of electrical contacts 108b that are part of the leadframe 102. Because leadframe 102 (including connectors 108b) is sandwiched between two PCBs 104 and 106, it is clear that Rostoker does not teach "a second portion of the bus structure that is integrated within the PCB." (Emphasis added).

In summary, Figure 11 of Rostoker fails to teach or disclose a PCB including a plurality of conductive layers, each separated by a non-conductive layer. In addition, Figures 1 and 2 of Rostoker fail to teach "a second portion of the bus structure that is integrated within the PCB." Therefore, Rostoker fails to teach "a first integrated conductive bus structure extending from a first edge of the PCB, wherein a first portion of the bus structure that extends from the edge of the PCB forms a plurality of electrically separate contacts of a connector and a second portion of the bus structure that is integrated within the PCB couples each of the contacts to at least one conductive trace of the PCB through plated holes." Because Rostoker fails to teach each and every element of the claimed invention, the rejection of claims 1, 5-6, 8-9, and 15

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under 35 U.S.C. § 102(b) is improper and should be withdrawn, which action is respectfully requested.

The Examiner also rejected claims 2-4, 10-13, 16-19, and 21 under 35 U.S.C. § 103(a) as being unpatentable over Rostoker, in view of Keyser (U.S. Patent No. 6,579,105). However, Keyser does not teach or suggest the claimed features missing from Rostoker, as discussed above. More specifically, Keyser does not teach or suggest an "integrated conductive bus structure extending from a first edge of the PCB, wherein a first portion of the bus structure that extends from the edge of the PCB forms a plurality of electrically separate contacts of a connector and a second portion of the bus structure that is integrated within the PCB couples each of the contacts to at least one conductive trace of the PCB through plated holes." Because Keyser, in combination with Rostoker, does not teach each and every element of claims 2-4, 10-13, 16-19, and 21, the rejection of those claims under 35 U.S.C. § 103(a) is improper and should be withdrawn.

Finally, the Examiner rejected claims 7, 14, and 20 under 35 U.S.C. § 103(a) as being unpatentable over Rostoker in view of "Bissey [sic]" (U.S. Patent No. 6,054,754). However, Bissey likewise does not appear to teach or suggest the claimed features missing from Rostoker and discussed above. More specifically, Bissey does not teach or suggest an "integrated conductive bus structure extending from a first edge of the PCB, wherein a first portion of the bus structure that extends from the edge of the PCB forms a plurality of electrically separate contacts of a connector and a second portion of the bus structure that is integrated within the PCB couples each of the contacts to at least one conductive trace of the PCB through plated holes." Because Bissey, in combination with Rostoker, does not teach each and every element of claims 7, 14, and 20, the rejection of claims 7, 14, and 20 under 35 U.S.C. § 103(a) is improper and should be withdrawn.

By way of the foregoing discussion, Applicants have demonstrated that claims 1-21 are not anticipated by Rostoker and would not have been obvious in view of the cited combinations of Rostoker, Keyser, and Bissey. Accordingly, the rejections of claims 1-21 under 35 U.S.C. §§ 102(b) and 103(a) should be withdrawn.

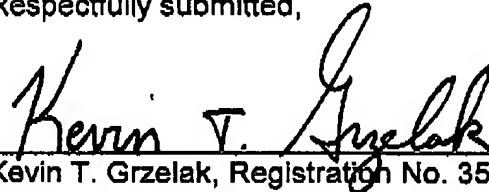
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Applicants submit that this amendment is fully responsive to the above-referenced Office Action and that the claims are in condition for allowance, such allowance being respectfully requested.

CONCLUSION

If the Examiner has any questions or comments with respect to this amendment, the Examiner is encouraged to contact the undersigned at 616/949-9610.

Respectfully submitted,



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Annotated Sheet 1 of 2 Showing Changes

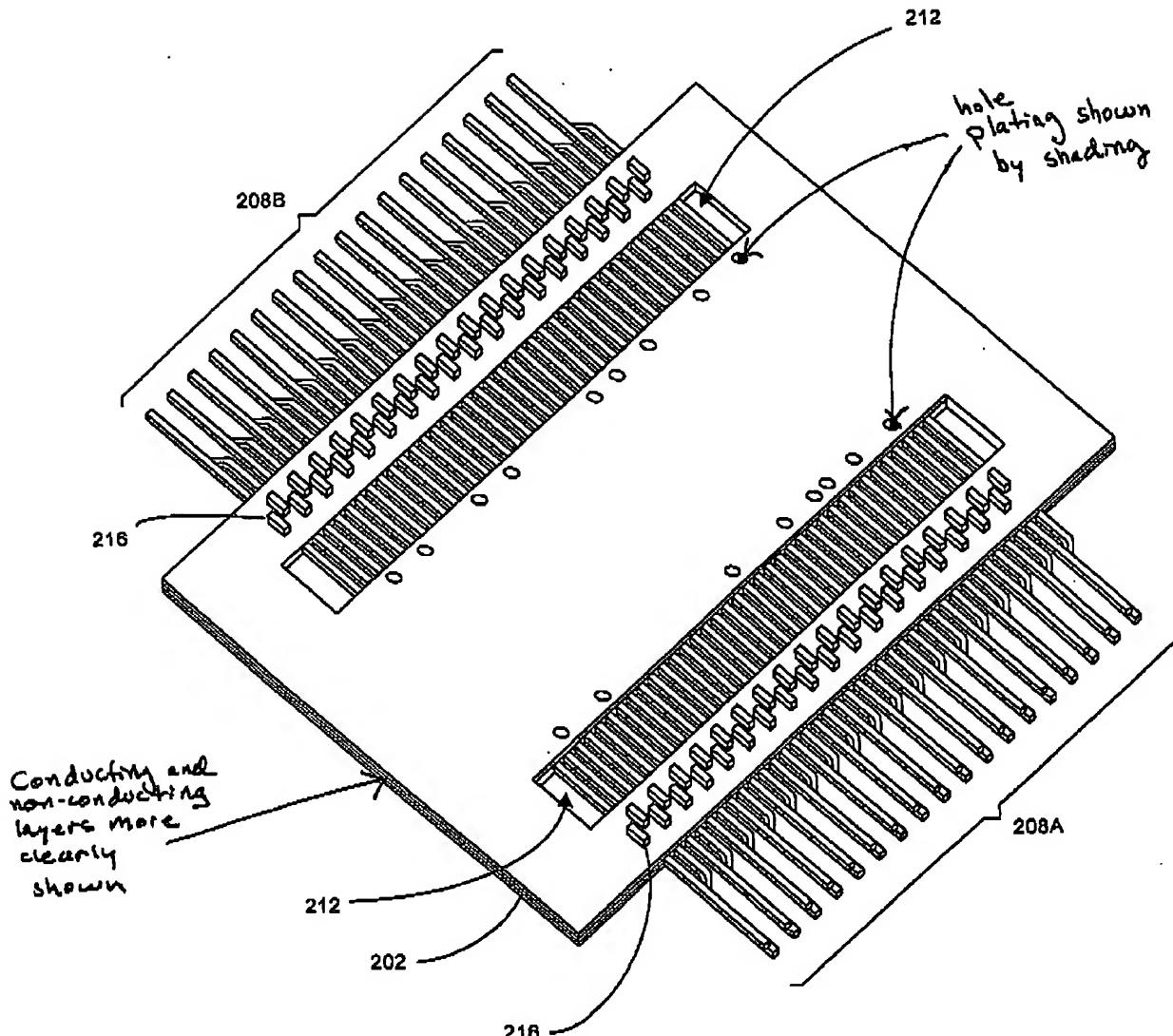


FIG. 2

AUTOMOTIVE ASSEMBLY SHOWN

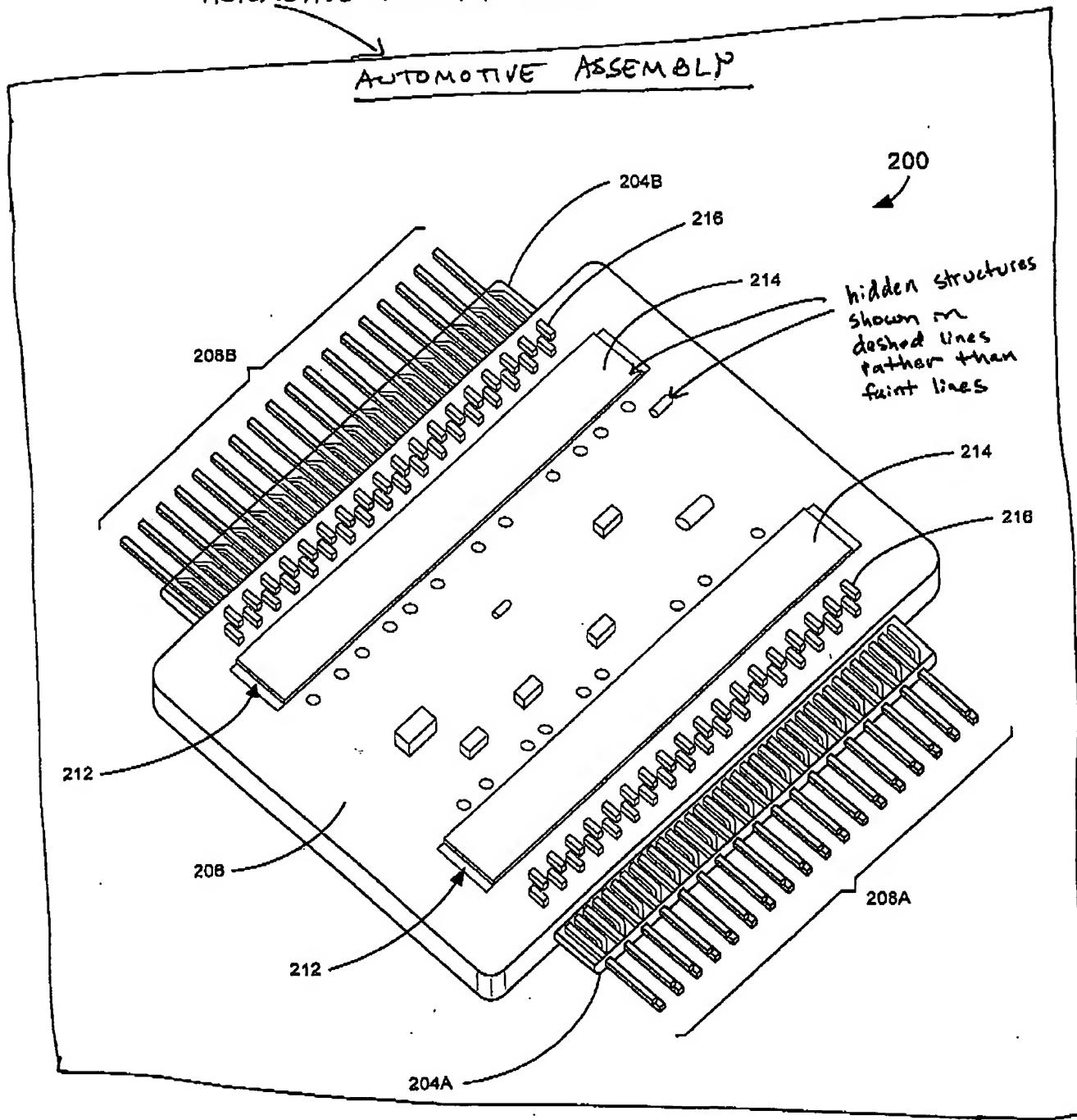
AUTOMOTIVE ASSEMBLY

FIG. 2A

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Annotated Sheet 2 of 2 Showing Changes